DOCUMENT RESUME

ED 322 214 TM 015 460

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TITLE Learning, Teaching and Assessment: A Theoretical Overview. SCRE Project Report No. 20.
INSTITUTION Scottish Council for Research in Education.
SPONS AGENCY Scottish Education Dept., Edinburgh.
REPORT NO ISBN-0-947833-43-9
PUB DATE Jun 90
NOTE 44p.; Working paper prepared as part of the first stage of the Teaching, Learning and Assessment in the National Certificate Project.
AVAILABLE FROM Scottish Council for Research in Education, 15 St. John Street, Edinburgh EH8 8JR, Scotland.
PUB TYPE Information Analyses (070) -- Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Educational Assessment; Educational Research; Educational Theories; Foreign Countries; Higher Education; *Instruction; *Learning Theories; Literature Reviews; *National Programs; Program Evaluation; Research Methodology; Teacher Certification; Teacher Education; *Teaching Methods; Theory Practice Relationship
IDENTIFIERS *National Certificate (Scotland)

ABSTRACT

This overview of the literature on teaching, learning, and assessment was prepared to help develop a shared understanding by educators, researchers, and students to inform subsequent research conducted by the Scottish Council for Research in Education (SCRE) into the National Certificate in Scotland. Section 1 serves as an introduction to the paper. Section 2 reviews learning theories back to the time of Plato and Aristotle. Topics include: rationalism, associationism, constructivism, the cognitive information processing model, metacognition, and student-oriented approaches to understanding learning. Criticisms of each of these theories are provided. Section 3 reviews empirical work on teaching. The three strands identified in this area include: (1) attempts to reconcile the nature of the teaching process with the requirements of particular theories of learning; (2) attempts to impose descriptive categories on the process; and (3) examinations of teachers' own thinking about the teaching process. Section 4 offers an analysis of the norm-referenced and criterion-referenced traditions in assessment. Section 5 examines the ways teaching, learning, and assessment are treated in the literature concerning Scotland's Action Plan and the criterion-referenced National Certificate program. Section 6 outlines the role of this overview with regard to research proposed under the SCRE project. Five figures and a 46-item list of references are included. (SLD)

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Learning, Teaching and Assessment
A Theoretical Overview

Harry Black
John Hall
Sue Martin

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Learning, Teaching and Assessment
A Theoretical Overview

Harry Black
John Hall
Sue Martin

A working paper prepared as part of the first stage of the SED-funded *Teaching, Learning and Assessment in the National Certificate* Project

The Scottish Council for Research in Education

SCRE Project Report No 20

©The Scottish Council for Research in Education June, 1990

ISBN No 0 947833 43 9

Report arising from the Teaching, Learning and Assessment in the National Certificate project (reference H/330/1) funded by the Scottish Education Department between October 1988 and September 1990.

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Printed by the Scottish Council for Research in Education, 15 St John Street, Edinburgh EH8 8JR

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ACKNOWLEDGEMENTS

The authors gratefully acknowledge the following sources for permission to reproduce figures in the text of this report:

The Scottish Academic Press and Dr Sally Brown for Figure 3.1 on page 15, from Brown and McIntyre (1988) 'The Professional Craft Knowledge of Teachers', *Scottish Educational Review;* The School of Further Education, Jordanhill College for Figure 3.2 on page 18 from *Teaching Methods in Scottish FE Colleges*; The further Education Unit for Figure 3.3 on page 19 from Gibbs, G. (1988) *Learning by Doing, A Guide to Teaching and Learning Methods.*

1 INTRODUCTION

The first stage of the 'Teaching, Learning and Assessment' in the National Certificate Project required a review of the literature. This comprised the general literature in these areas and the documents describing their form both in the 'Action Plan' (SED 1983) and in subsequent documents published by the Scottish Education Department and SCOTVEC. This was a demanding task, not least where the 'general' literature on teaching, learning and assessment was concerned.

It was important that the team should share a basic understanding on thinking in these areas before our empirical data on staff, student and employer views were gathered. Without such an understanding, it would be difficult to agree on the nature of the questions we wanted to ask, to be confident that we would be seeking data on similar issues when we conducted our interviews and to know that we were defining terms in similar ways.

It can be a salutory experience at the beginning of a project to force oneself to put on paper what one knows about the topic of the research. It is surprisingly easy to forget the limited nature of one's understanding at this stage.

Structure

The report is presented in five sections in addition to this introduction. Section 2 is an account of thinking about learning. Writing about the nature of learning goes back to the time of Plato and Aristotle and the range of theories is substantial. It includes accounts of classical 'rationalist', 'behaviourist' and 'constructivist' thinking as well as more recent approaches. Amongst these are 'information processing' approaches which are based on analogies with computer systems, student-oriented theories related to styles of learning and to learning strategies and metacognitive theories which make claims about the importance of the conscious management and monitoring of cognitive skills in effective learning. However, despite the extent of this work, there is surprisingly little evidence of its having a direct impact on classroom practice.

Empirical work on teaching which is the focus of Section 3 has a less extensive pedigree. There is a considerable range of writing in this area but much of it is anecdotal and represents individuals' pragmatic 'solutions' rather than firmly grounded theory. Amongst the more firmly based work we identified three strands. The first comprises attempts to reconcile the nature of the teaching process with the requirements of particular theories of learning. Work in this area has identified the teaching approaches appropriate to rationalist, behaviourist and constructivist theories as 'insight', 'impression' and 'rule' models respectively and no doubt similar associations could be identified to meet the needs of metacognitive strategies or information processing models. At a more particular level psychopedagogic theories have attempted to identify optimum teaching strategies for particular elements of learning such as attaining concepts or mastering knowledge. Other studies claim to show the importance of reconciling preferred learning styles and strategies with appropriate teaching approaches. It is work in these areas in particular which suggests that there may be dangers in making too great a distinction between teaching and learning in analysing the teaching process.

A second strand of the literature on teaching comprises attempts to impose descriptive categories on the process. Amongst the most influential have been distinctions between 'traditional' and 'progressive' methods but it is not always possible to assume general agreement on how to categorise approaches. Finally, a third and more recent strand has challenged the notion of imposing categories from 'outside' teaching and instead has its roots in teachers' own thinking about the nature of the teaching process.

But perhaps the most extensive writing in this area comprises accounts of specific methods and strategies which it is claimed have particular advantages. Of clear relevance to this paper is the move towards teaching within a modular structure and the claims that are made for this. There would appear to be little empirical evidence for many of these claims but their importance as ideas about the teaching process around which strategies and policies are marshalled is clear. Section 3 therefore concludes with an account of ways in which it may be possible to categorise specific methods and strategies in terms of 'student activity' and relative 'openness' of the learning process.

Section 4 on assessment offers an analysis of the norm-referenced and criterion-referenced 'traditions' which represent the two major models which have dominated thinking in this area in recent years. The norm-referenced model has the longer history and is deeply associated with rationalist assumptions about intelligence and general attainment. In contrast the more recent criterion-referenced approach emphasises description rather than comparison. Perhaps the most interesting characteristic of both of these models is that they both have their roots in the perceived pedagogic needs of their eras.

It is clear from the literature that current thinking about assessment goes beyond consideration of the way in which assessments are carried out. Section 4 therefore concludes with a consideration of thinking about what should be assessed, how assessment might take place, who carries the responsibility for assessment and why and when assessment should take place.

The penultimate section of the working paper offers an account of the ways in which teaching, learning and assessment are treated in the Action Plan and National Certificate literature alongside a reflection on how this relates to the theoretical understandings outlined in Sections 2, 3 and 4.

Establishing clear links in statements about learning was the most difficult. There is no shortage of discussion about learning in the applied literature but little about its theoretical underpinnings. Statements about content and purpose are accompanied by assertions that learning is more likely to take place if certain approaches such as 'student participation' and 'negotiation' are accommodated. The problem is that while these strategies may bring about effective learning little evidence is offered to convince one of the case.

There is little in the way of explicit references to teaching in the Action Plan. The links between the 'applied' and 'theoretical' literature are somewhat tenuous. For example it is stated that, rather than aiming at 'acquisition of knowledge', for which didactic approaches are suitable, a range of teaching approaches should be employed to foster the wider aims of learning. Evidence that these approaches would be more appropriate to the aims of the Action Plan

is not given. As with learning there is an assumption that the desired aims in teaching are guaranteed following selection of the appropriate 'ingredients' for a particular recipe.

The area of assessment in the applied literature has the closest correspondence with the general literature. This is perhaps because there has been a switch from an essentially norm-based system to one which is clearly criterion-referenced in nature. The purposes and mechanics of assessment are clearly stated and the rationale for this major change is spelt out. If any gap exists with regard to assessment it is in relation to those areas which have been completely turned around in the change to a criterion-referenced system. For example there is an underlying assumption that the guidance given will produce good quality assessment instruments and decisions and yet the jump from statistical to human judgement for making assessment decisions is given very little attention.

The final section outlines the role which this overview of the theoretical and applied literature has in our research. The difficulty of tying questions in interviews specifically to the theoretical understandings set out in this paper is clear. However, we would hope that the framework they supply will enable us to understand and explain the data which the research team gathers.

Intended use

This working paper does not claim to be a comprehensive account of teaching, learning and assessment. It should be seen as an attempt by the team to commit their own starting point to paper. If nothing else it alerts the reader to the schism which exists between theoretical accounts of learning and teaching and the Action Plan/National Certificate literature. We suspect that this is not unusual. Most curriculum development relates to what is seen as a need or a gap in existing structures. Indeed the Action Plan was probably more concerned to articulate such a need with appropriate teaching and learning approaches than is typically the case. Furthermore, there is little to suggest that the basic thinking on teaching and learning in the Action Plan is in conflict with what might appear to be 'appropriate' strategies - although this of course begs the question of in whose terms one judges appropriateness. It will be one of the functions of this research to try to establish whether, once applied by teachers, the Action Plan strategies can more easily be described in terms of fundamental theories.

Our reflection on the relationship between fundamental and applied thinking about assessment is different. The National Certificate is so clearly based on criterion-referenced assessment that it makes little sense to evaluate it in terms of alternatives. But just as with teaching and learning, it will be a function of the research to establish the relationship between the literature and applications in classrooms and workplaces.

2 LEARNING

Documented speculation about learning and the way in which it takes place dates back at least to the time of Plato and Aristotle. Even in this early literature, conflicting accounts of the process underline the complexity of learning and the difficulty we have in fully understanding how it takes place. In the present century psychologists have directed considerable attention to the study of learning and there is now a number of distinct theories each of which claims to explain the processes involved.

To simplify our description of this literature we will adopt the expedient of describing two groups of learning theory; the 'classical' and 'contemporary'. It is important to stress that this is an expedient. 'Classical' learning theories are still held, at least in part, to be appropriate descriptions of the learning process. 'Contemporary' theories have, at least in part, their roots in classical theories. The distinction is therefore a chronological one rather than our value judgement that one set of theories is more appropriate than another.

CLASSICAL LEARNING THEORY

The literature on the theory of learning is varied and extensive, but three main schools of thought can be distinguished. These comprise the **rationalist** school, which has its earliest origins in the work of Plato; the **associationist** or behaviourist school, which is linked to the work of Aristotle; and the more recent **constructivist** approach, which can be traced back to the work of Kant in the 18th century.

Rationalism

Rationalist theories about learning claim that it is essentially a process of uncovering innate knowledge. This 'knowledge' includes basic drives such as 'the sex urge' and 'aggression', and a 'natural instinct' to be 'competitive'.

It is also claimed by the rationalist school that certain competencies, such as language and mathematical ability, are innate. Chomsky (1980), for example, has claimed that the capacity to deal with the number system is 'as far as we know unique to humans ... it seems reasonable to suppose that this faculty is an intrinsic component of the human mind ... that the capacity to deal with the number system or with abstract properties of space is surely unlearned in its essentials'.

Thinking about learning in this way has had a pervasive influence in education. The notion that some children are 'academic' while others are 'practical and technical' was the fundamental principle upon which selective education was built in the 1940s. The objective of nurturing the 'spontaneous manifestation' of a child's 'potential' lies behind many approaches to education, but is perhaps most explicitly manifested in the Montessori schools, which are less common in Britain than in some other parts of Europe. In broader terms, the acceptance of a notion of 'general ability' or 'general intelligence', which pervades many discussions about teaching and learning, are most easily explained by rationalist theories.

Associationism

The associationist school sees the basis of learning differently. According to associationist theories, we learn by associating stimuli which frequently come together. We learn to associate a flat, black surface used normally in the vertical position and on which users write in chalk with the concept 'blackboard'. A flat vertical surface of any colour on which the user pins material, becomes associated with the concept 'pinboard'.

Learning takes place through a 'conditioning' process by which we come to associate certain unique stimuli with common conceptual categories. This conditioning can either take place in a 'classical' or 'operant' way. In classical conditioning, our general experiences lead to conditioned responses. Examples might include food advertisements which 'make your mouth water'. Operant conditioning is more interventionist, and involves the use of rewards or reinforcements for certain actions. Positive reinforcement involves a reward for a certain action, while negative reinforcement involves the removal of something unpleasant as a reward for a particular response.

Associationist theories can be used to explain certain strategies adopted by teachers. In particular, reinforcements such as prizes, praise and 'gold stars' have been widely used, on the assumption that they will reinforce the desirable outcomes of the learning process. These theories have also formed the basis of interventionist approaches which use behaviour therapy to deal with disruptive pupils or children with learning difficulties. They are also associated with programmed learning strategies.

Constructivism

Constructivist theories also assume that learning is a product of experience, but argue that this is more complex than the mere association of a set of stimuli with a particular single response. In relation to concept learning, for example, constructivists would argue that examples are not simply members or non-members of the concept set, but better or worse examples. Thus, some instances of 'blackboard' may be clear instances of the concept, while others, such as those on which notices have been pinned, rather than messages chalked, will be 'fuzzy'. In this case, the 'learner' must decide the relative value of 'pinning' and 'chalking' as defining features, in order to decide whether he or she has encountered a black pinboard, or a blackboard upon which a notice has been pinned.

In order to make these decisions, the learner will assimilate this new instance of a blackboard or pinboard into his or her existing schemata for these objects. It is these schemata which allow individuals to interact with the continual variability of the real world. Furthermore, this interaction between the existing schemata and the new instance will result in a growing sophistication of the concepts 'blackboard' and 'pinboard'. This, the constructivists would argue, is a more realistic way of describing the learning process than the static relationships between learners and objects implied by associationist theories.

These theories, and particularly the branch of 'developmental constructivism' associated with the work of Piaget, have been

particularly influential in some areas of education in recent years. Much of the Plowden Report on primary education, for example, was built around this theory. Constructivist thinking stresses the needs of the individual child, and asserts that it is appropriate to identify previous learning before teaching takes place. This is because learning is seen as largely a process of building upon, and refining, already existing schemata. Perhaps the most elaborate application of such theories can be found in Bloom's notion of 'mastery learning'. According to this theory, together with motivation and differences amongst teachers, differences in the knowledge that children bring to new learning situations is one of the most important determinants of success in the learning process.

Rationalist, associationist and, particularly, constructivist theories are still widely held and are continuing to evolve. We would stress again that the distinction we make between 'classical' and 'contemporary' theories is an expedient we have adopted for the purpose of organising this report.

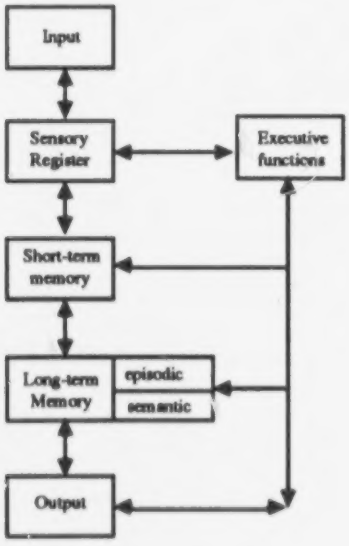
'CONTEMPORARY' LEARNING THEORIES

The Cognitive Information Processing Model

Theories of learning based on the Cognitive Information Processing (CIP) model of human memory retain distinctive features of both the associationist and constructivist schools of thought. They find room within them for both stimulus-response associations and the construction of meaning through the formation of schemata.

As its name implies, CIP theory is much concerned with the ways in which the memory stores and retrieves information. In describing models of the memory, CIP theorists tend to rely on metaphors which were originally derived from libraries, filing systems and indices (Broadbent, 1966), although it is now more usual to find that computers and computer databases form the vehicle of the metaphor.

Figure 2.1 Model of the Cognitive System



The basic model was first proposed by Atkinson and Shiffrin in 1968. A generally accepted (if simplified) version of the model is shown in Figure 2.1. It postulates a sensory register where perceptual data are 'checked in' prior to processing. **Short-term memory** is a limited capacity 'working memory'. Unless the learner pays active attention to the contents of short-term memory (for instance by 'rehearsal' or constant repetition) it will be lost before it can be transferred to more permanent storage. In contrast, **long-term memory** is claimed to have an almost unlimited capacity.

In the CIP model the 'executive' processes are analogous to a

computer operating system which operates invisibly behind programs, controls the flow of information into, around and out of the central processor, accesses disc drives and generally keeps the system running. It is suggested that there are similar functions of the brain which control and organise the flow of information into and out of memory. These executive functions will also determine priorities between competing tasks according to the perceived motivations and goals of the learner.

Certain educational implications can be drawn from CIP theory. It is suggested that:

> Proper pacing and presentation of material in manageable units is necessary if the short-term memory is not to be overloaded;
> Information to be learnt must be actively attended to if short-term memory is to process it and transfer it to long-term memory;
> Any representation which the student forms as a result of learning is the result of the combination of the new information and the previous schemata held by the student;
> Making proper use of this previous knowledge facilitates transfer of information to the long-term memory.

All of this leads to a picture of student learning as something which requires both careful management and the active participation of the student, and will be most effective when it builds upon his or her previous knowledge and experience.

Metacognition

In the last two decades cognitive psychologists have attempted to further their understanding of the process of learning by distinguishing between lower order cognitive skills (e.g. acquisition and retrieval of information) and higher order cognitive skills (e.g. deciding and selecting). A successful learner has not only learned but has **learned how to learn**. It is this added dimension of the management and monitoring of cognitive skills that has been termed metacognition.

Flavell (1976) gave one of the earliest definitions:

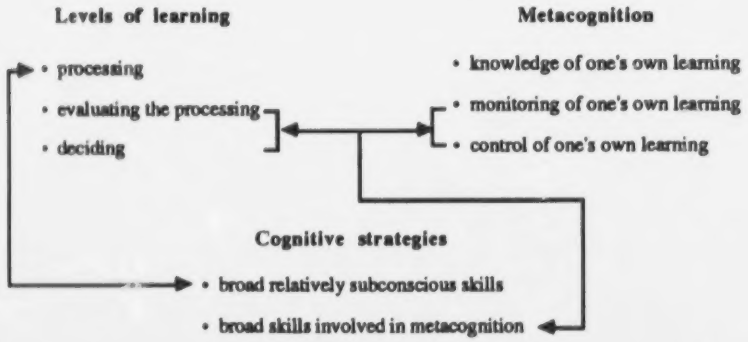
> Metacognition refers to one's knowledge concerning one's own mental processes ... to the active monitoring and consequent regulation and orchestration of these processes usually in the service of some concrete goal or objective. (p. 232)

Much of the research in this area has concerned the role of metacognition in the process of learning. Both theoretical and practical schemes have been put forward (Baird 1986, Flavell 1981). However, metacognition is a complex concept, not least because of the difficulties of distinguishing it from cognition and deciding whether it is necessarily a conscious activity or may become habitual and operate at a level below that of conscious thought. Research on this topic is limited and has chiefly served to highlight the difficulties of definition, recognition and application.

Metacognition is more than 'intelligence' or mastery of the 'correct'

procedure for each situation. It is an ability to apply skills and strategies appropriately in new situations, and to evaluate learning progress. The successful learner will not only have developed a range of strategies and skills that are transferable, but will also be able to manage these effectively. Figure 2.2 shows Baird's (1986) model of the relationship between cognition, metacognition and the process of learning.

Figure 2.2 Relationship between cognition, metacognition and the process of learning



It is generally agreed that metacognition involves awareness of one's own mental processes and the ability to reflect on these and that this capacity can be learned from experience, example and teaching (Nisbet and Shucksmith 1986). However, the possession of this ability does not necessarily mean that a student will use it. Part of the explanation for this is the influence that the nature and requirements of learning tasks has on the approaches adopted by students. Flavell (1979) surmises that 'metacognition is especially likely to occur in situations that stimulate a lot of careful, highly conscious thinking'. He emphasises that circumstances must be conducive to learning before metacognition can be demonstrated and consequently before any attempt can be made to 'teach' metacognitive skills.

Above all else, theories of metacognition stress self-awareness and self-control and place the responsibility for learning squarely on the student. The teacher's task has less to do with instilling knowledge than affecting attitude, encouraging motivation and providing resources which enable the student to learn how to learn.

Student-oriented Approaches to Understanding Learning

Research on learning in the last decade, particularly that undertaken by Pask, Marton and Entwistle, has moved from a traditional psychometric and quantitative approach towards methodologies which place greater emphasis on understanding students' views of learning, particularly in ordinary academic settings. While the traditional psychometric approaches have analysed how much a student learns, these approaches explore what has been learned and the way in which it was learned. A further distinction is that they do not assume that all things are learned in the same way, irrespective of the context in which learning occurs.

Pask made the distinction between styles of learning, which are the more general procedures used in the process of learning, and strategies of learning. A strategy was defined as the manifestation of a style under a particular set of conditions. The focus of Pask's work was the approaches or styles that students used for a particular

task (Pask and Scott 1972). Records of the choices and decisions made by students in a complex learning task were analysed to infer what styles were being used. Two types could be distinguished: **holist** and **serialist** students. The former was characterised by **'comprehension learning'** where a student would typically secure a broad framework before building up the details. He or she would be a global thinker, comparing, distinguishing, finding analogies or simplifying a situation. In contrast, a serialist would typically employ **'operation learning'**, focusing on definitions and moving one step at a time, acquiring relational rules and mastering procedural details at the expense of building up a broader perspective. Pask identified typical deficiencies associated with these two styles of learning. In acquiring a global perspective, the holist was likely to introduce redundant information and misuse details. This he termed 'globetrotting'. Serialists were more likely to concentrate on accurate detail. However, they also gathered many unrelated pieces of information and were unable to fit them together in a comprehensible structure. However, students did not necessarily remain consistently within one category. Rather, there was a **tendency** for a student to adopt one of these styles. The 'ideal' would be the **'versatile learner'** who could use whatever style or strategy was best suited to the needs of the occasion.

Pask not only identified learning styles but also considered the effect of teaching styles on the outcome of the task. In an experiment half the students were taught with a teaching style which matched their learning style while the other half were taught by inappropriate teaching methods. Students with matched styles (holist with holist and serialist with serialist) made significantly better progress than those students in the mismatched groups.

Marton's work focussed on students' strategies. Students were given an academic article to read without any instructions on the aim or requirements of the task and were told to adopt their usual working strategy. Questions were then asked on the article in interviews. Marton and Säljö (1976) described the differences exhibited by students as varying between **deep-level** and **surface-level** processing. Students who adopted a deep-level approach questioned the author's arguments and compared the evidence presented with the conclusions given. A surface-level approach was characterised by memorisation of specific facts or parts of the text. The research of this group further showed that the approach adopted by students was affected by the nature of the task, by the task requirements and by the students' expectations of the type of question which would follow. That is, students were cue-conscious. Thus it was not necessarily the case that students always adopted their normal or 'optimum' working mode. For example, surface questions were likely to induce surface approaches even if the student would normally exhibit a deep approach. However, it was noted that deep questions were unlikely to produce deep approaches in students who would normally be classed as using surface approaches. It was also noted that those students who tended to take a surface approach also tended to think of learning as an 'accumulation of facts', while those with a deep approach thought of it as 'understanding reality'.

Work of a similar nature carried out by Biggs (1978, 1980) and Biggs and Collis (1982) focussed on the **orientation** of students towards studying. Three main types were identified which were labelled **personal meaning, reproducing** and **achieving**

orientations. The first two can be associated with deep and surface approaches to learning respectively. Students who value personal meaning and development as a goal of education are likely to be intrinsically motivated and to exhibit a deep learning approach. Students whose motives are largely extrinsic and who see the main purpose of education as vocational preparation are likely to adopt a surface approach to learning. An achieving orientation is characteristic of students whose aim is to achieve high grades (with or without understanding). Their learning style is characterised by organisation and strategies for playing the game to win and may reflect both deep and surface approaches.

Finally, Entwistle and his colleagues (Entwistle 1981; Entwistle, Hanley and Ratcliffe 1979; Entwistle, Thompson and Wilson 1974) provided additional evidence for deep and surface approaches and showed that these are related to the level of understanding reached by the students. In addition they have considered other influences on learning such as personality, study methods and motivation and have identified 'types' of students ranging from the 'stable and motivated' to the 'idle and unmotivated'. Their most recent work they have looked at the effects of different contexts on learning. One of the factors highlighted in this work was the importance of assessment procedures in influencing students' study strategies. For example it appeared that periodic short answer tests were likely to induce a surface approach and foster an 'accumulation of information' conception of learning, as this was all that was required for success in the assessments.

CRITIQUE

While each of the classical theories may have convincing characteristics, each has intrinsic limitations. In the rationalist school, there is a tendency to extrapolate from simple phenomena to much broader assertions, without empirical evidence. There is also a tendency to explain away complex phenomena by arguing that they are 'innate', without proffering evidence for the existence of innate variables. While those of the associationist school are more overtly committed to empirical evidence for their theories, questions have to be asked about the long-term success of learning within a behaviourist frame. Furthermore, the empirical evidence is often associated with discrete and rather artificial events, which may or may not have relevance to the much more complex environment in which most learning takes place. Finally, while those of the constructivist school are committed to empirical evidence in the same way as the associationists, and while their 'fuzzy concepts' may be a reflection of the complex reality of learning in the real world, the exact nature and origin of 'schemata' and 'prototypes' - on which many of their theories are based - remains vague.

Similar criticisms can be made of some of the more recent approaches to learning theory. Cognitive Information Processing theory rests on an analogy with computing technology. There is no real proof that the distinctions which it makes between different types of memory are as clear-cut as it would like to make out. Indeed, the complex inter-relationships between functions of the brain seem to provide evidence that this is not in fact the case.

The main problem with metacognition is one of definition. It is unclear from the literature whether metacognition is seen as a

conscious process or as one which, through habituation, has become automatic. It is also unclear how it differs from normal rational thought or what, in traditional terms, would be called introspection. At a more general level, it can be argued that the traditional psychological approach to experimentation in learning has limitations. The extent to which it is appropriate to extrapolate from lower animals to humans, or from single isolated aspects of learning to learning in general, must be open to question. It is however less easy to level these criticisms at more recent student-centred approaches. Indeed, one of the distinguishing features of this work is its roots in classroom learning rather than in contrived experimental settings. But there is little evidence, at least as yet, of teachers using these theoretical understandings. This could be because of inadequate dissemination of the ideas. Alternatively it might be that teachers are unclear about what to do if students are adopting serialist, holist, deep or surface approaches.

These criticisms must, at least in part, be a reflection of the complex nature of learning, and the primitive state of our understanding of how learning takes place. But the literature suggests that little attention is paid to them by teachers. Why should this be the case?

To begin with, the way in which the theories have evolved presents problems for teachers. The various theories have tended to grow as alternatives rather than building on each other, or through one 'better' theory replacing another which has been discredited or become redundant as knowledge progressed. While in some circumstances it may be useful to have a number of theories which may help a practitioner to arrive at an understanding. This may cause problems. If the 'wrong' theory is chosen, this may have real rather than academic consequences for the learner. In short, the nature of our understanding of the learning process at the present time means that the translation of theory into practice can have uncertain outcomes.

This clearly raises questions about the immediate relevance of learning theory to classrooms in general. Educators want to know how to use a given piece of knowledge about how learning takes place, and will look to theories for such explanations; theorists want to be able to explain the act of learning, and may be satisfied with that as an end in itself. This may in part explain why those engaged in the day-to-day practice of education have doubts as to the relevance of such theories to their own practice.

It must also be recognised, however, that the perceived lack of articulation between learning theories and learning in the classroom may in part have its origins in the nature of learning in the educational context. Formal education may have particular characteristics which constrain or distort learning. The drive or motivation which is associated with external examinations, for example, may mean that the student focuses on particular aspects of the learning process, or is willing to learn in ways which lead to short- or medium-term retention without 'understanding'. 'Traditional' learning theory, as described by the models above, may therefore be accounting for learning in a very different context than is appropriate to the artificial priorities of the classroom. Contemporary, student-oriented approaches may have more immediate relevance for real learning situations. The extent to which these, or other theories about learning influence what happens in National Certificate learning contexts will be a focus for the current project.

3 TEACHING

Learning and teaching are fundamentally different kinds of activity. While learning is a covert mental activity which can only be known through its results, teaching is a public overt behaviour which can be readily observed. There is thus a great deal of scope for theorising about what might be happening in the process of learning (as we have seen in the previous section). While there is much less theorising about teaching there is, however, wide scope for classification of teaching activities.

In our analysis of the literature on teaching we identified four types of thinking. Of these, what we have chosen to call 'learning-related' and 'teacher-derived' thinking have the more sound empirical basis. The first comprises thinking which explicitly attempts to relate teaching strategies to theories about learning. The second attempts to build an understanding about teaching grounded in the accounts of teachers. The most prevalent accounts of teaching however are those which attempt to create conceptual categories of the different approaches to teaching, the most obvious being distinctions between 'progressive' and 'traditional' methods. These, and a number of accounts which go no further than describing teaching, form the second pair of the four substantive sections of this part of the report.

Learning-Related Thinking

Fenstermacher (1986) in a philosophical analysis of the concept of 'teaching' makes the point that the two statements 'a teacher teaches' and 'a student learns' are not analogous. When we say 'a teacher teaches' we are referring to the activities in which the teacher engages, but when we say 'a student learns' we are referring to the outcomes of some activity in which the student is engaging. A strictly analogous statement would be 'a student students'. We do not normally talk about students in this way, but it is a useful reminder of the importance of the activities which lead to learning. Only the student can ensure that he or she learns something. A teacher cannot force a student to learn, but can encourage him or her to take part in certain student-like activities which (it is hoped) will promote learning. As Fenstermacher puts it: 'a central task of teaching is to enable the student to perform the tasks of learning'.

Much theorising about teaching is dependent upon, and grows from, theories of learning. Scheffler (1967) outlined three 'Philosophical models of teaching' which are analogous to the schools of thought on learning which we have already discussed. He called these the **insight model**, the **impression model** and the **rule model**.

The **insight** model is analogous to rationalist theories of learning and goes back to Plato and (Scheffler's preferred precursor) St Augustine. It denies that knowledge can be supplied from outside the learner, and maintains that it depends on the quality of insight or vision of the learner. The role of the teacher is to prompt internal self-examination by the learner who can then grasp the reality pointed out to him for himself (and by himself). The ultimate model of this kind of teacher is Socrates.

The **impression** model sees the learner's mind as a blank slate upon which knowledge must be written by the teacher. Knowledge is seen as bits of information which can be supplied to the learner. The

teacher is the supplier of information and the exerciser of those mental powers which are concerned with the perception and discrimination of incoming sense data. This kind of theory is typified by John Locke and relates to associationist (and more particularly, behaviourist) theories of learning.

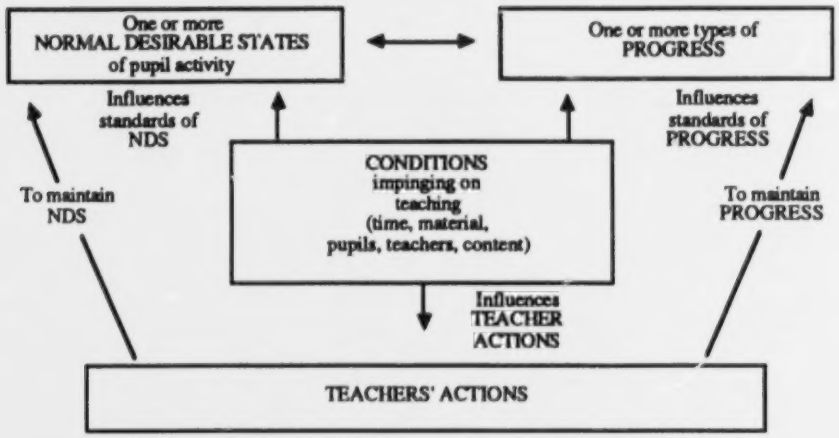
Just as constructivist theories of learning were traced back to Kant, so too is the **rule** model of teaching. It asserts the primacy of reason, and that reason is always a matter of abiding by rules or principles. On this model, Scheffler says, 'Teaching ... should be geared not simply to the transfer of information, nor even to the development of insight, but to the inculcation of principled judgement or conduct, the building of autonomous and rational character which underlies the enterprises of science, morality and culture'. Both the impression and insight models can be subsumed within this rule model - 'For, intermediate between the public treasury of accumulated lore mirrored by the impression model, and the personal and intuitive grasp of the student mirrored by the insight model, it places general principles of rational judgement capable of linking them'.

Perhaps the most explicit British attempt to relate teaching strategies to principles of learning arising from empirical work in the area is to be found in the work of Stones (1979). Stones enunciates this relationship through the notion of **'psychopedagogy'** which he defines as 'the application of theoretical principles from psychology to the practice of teaching'. He proposes strategies for the teaching of concepts, psychomotor skills and problem solving which are based on what are claimed to be soundly established principles. The weakness of his work is that there is little offered in the way of empirical evidence for these claims. They do however have much in common with the work of Gagné (1977) and Klausmeier et al (1974) in the United States and the work on learning hierarchies by White (1973) in Australia. However, there is little in the literature to suggest that teachers have widespread knowledge of this work.

Teacher-derived Thinking

A recent move has been to focus on the experience of teachers in order to elicit a model of teaching that is grounded in teachers' experience. This does not reject or ignore extant models or theories but aims to provide a framework into which, typically, teacher trainees can build and personalise their own teaching ideas and experience. The work of Brown and McIntyre (1988) is based on teachers' descriptions of their own teaching. Their conceptualisation of teaching, based on operational knowledge and experience, generated three main factors. Teachers' main goal was to maintain **normal desirable states (NDS)** of activity, such as pupils being occupied with work carried out in a laboratory experiment. These normal desirable states were often seen as an end in themselves, but could also be accompanied by a notion of pupil **progress** and both factors were seen as subject to the **conditions** imposed by any particular set of circumstances, eg time and resources (see Figure 3.1). This research emphasises that these teachers' main concern was with states of student activity. Such learning as occurred was a result of this activity but was not directly under the control of the teacher.

Figure 3.1
Teachers' Evaluations of their own Classroom Teaching: Concepts and Inter-Relationships



Conceptual Categories

The most prevalent work on teaching has not however been characterised by theorising but by attempts to create conceptual categories of different approaches to, or styles of, teaching. In the last two decades the most prominent of these has been the distinction between **'Traditional'** and **'Progressive'** teaching styles put forward by Bennet and his colleagues (1976). However, such broad categories raise as many questions as they answer. For one thing the definition of what constitutes 'traditional' or 'progressive' is difficult to arrive at with any degree of consensus. It is also unlikely that any teachers are so entirely consistent in their approach that they can be said to be in one camp or the other at all times. If what counts are the outcomes of education, then it seems possible that both routes (depending on definition) can be equally successful for some pupils.

Barnes, Britton and Rosen (1971) put forward a classification system which depended on the notions of **'interpretation'** and **'transmission'**. Teachers concerned with interpretation 'seek to engage with the pupil's existing state of knowledge and ... try to "interpret" what is to be learned so that the pupil can get a *personal* grasp of it'. Teachers concerned with transmission, on the other hand, 'see their role as providing ... clear and well structured information which forms the "body of knowledge" in their subject' (quotations from Spencer, 1983). These ideas seem to have links with the 'insight' and 'impression' models respectively. However, while these may be conceptually distinct ways of looking at the role of the teacher, Spencer (1983) found that most teachers could identify both interpretation and transmission as forming some part of their role. Teachers did not polarise into two camps on this dimension.

Powell (1985) distinguishes four 'modes of learning' which, by implication, suggest associated approaches to teaching. He suggests that people learn:

i) by receiving information and explanations from others seeking to transmit information and/or concepts
ii) by interacting with others, arguing out some issue
iii) by thinking out a problem for oneself or by seeking to apprehend some concept
iv) through having direct experience, thus ensuring that knowledge and concepts acquired are related to both one's sensory experience and to the way one operates in the world.

These categories are perhaps best seen as an elaboration of the 'transmission/interpretation' distinction. Powell's 'clusters' of teachers varied in the extent to which they inclined to one pole or the other and also in the extent to which, whatever method they preferred, they were successful in implementing it. Of course, the measurement of 'success' raises all sorts of other problems.

Dunkin and Biddle (1974) proposed a model of teaching which encompassed the characteristics of teachers and students, the circumstances in which they interact, their behaviours and the outcomes which are expected of their education. There are four sets of complex variables which it employs.

The first of these are the **presage** variables which consist of the characteristics, properties and abilities brought to the classroom by the teacher. **Context** variables are peculiar to the classroom and consist of all those factors to which the teacher must adjust his teaching style and strategies. **Process** variables express the events and interactions of the teaching process, while **product** variables concern the outcomes and effects of teaching on the student. The complexity of the model can be seen by examining the constituent factors which make up each of these types of variables.

The first set of factors which must be considered in the category of presage variables consist of such aspects of the teacher's background as their social class, age and sex, each of which will affect the ways in which they are perceived by their students. Then come factors associated with the teacher's own education – including such things as their university (or other) education, what kind of teacher training have they had? What experiences did they have while training? Then there are intrinsic properties of the teacher – their intelligence, motivation and personality traits. All of these things are, to a certain extent, 'fixed' before either student or teacher enters the classroom.

Context variables characterise the environment of the classroom which the teacher has to accommodate in his or her teaching. Amongst the most important of these are the characteristics of the students which, as with the teacher, comprise such things as social class, age and sex, their pre-existing knowledge and abilities, and their attitudes. But this must also be set within a wider community context – how large is the school or college? What kind of community is it a part of? What issues impinge on educational life? As well as these, there are also material considerations to take into account. These may include such things as class size and provision of resources, and could legitimately be extended to include the state of the fabric of the building, whether the lighting is adequate, and so forth. In the eyes of the teacher the context may range from being seen as a 'welcome challenge' to being an 'irrelevant annoyance', or worse.

Process variables concern the actual activities of teaching which can be observed. Both teacher and student behaviours are included, and the interaction between them is clearly important. Teachers not only induce student behaviour but also react to it. The result of the interaction between teacher and student behaviour should be some observable change in student behaviour.

Product variables are to do with the changes that come about in students as a result of teaching. There are two main classes of effects which teaching aims to bring about. The first are effects on immediate growth in the students, in terms of their knowledge of, and attitudes to the subject, along with the acquisition of other skills. Teaching is also expected to have long term effects on the adult personalities of the students and to influence the professional or occupational skills which they will eventually acquire. The product variables traditionally investigated are achievement and attitude. However, it may be more appropriate to investigate changes in the observable behaviour of students. It is suggested that learning (the traditional 'product' of teaching) is best thought of as a secondary aim. The primary aim of teaching, on this view, is to establish and maintain student involvement and activity in the classroom.

> and then doing whatever is necessary to see that the participants remain involved in that activity. The teacher's goal, in other words, is student involvement rather than student learning. It is true, of course, that the teacher hopes the involvement will result in certain beneficial changes in the students, but learning is in this sense a by-product or a secondary goal rather than directly concerned. (Jackson, 1966 p24, quoted in Dunkin and Biddle, 1974).

Product variables are 'induced desired changes' in students and, as such, their definition will depend on what changes are desired. We can also ask whether they are defined as such by the teachers themselves (as in the 'normal desirable states' of Brown's work) or by some other body in society which lays down the 'aims' of education, and whether these changes are meant to be of short or long term duration.

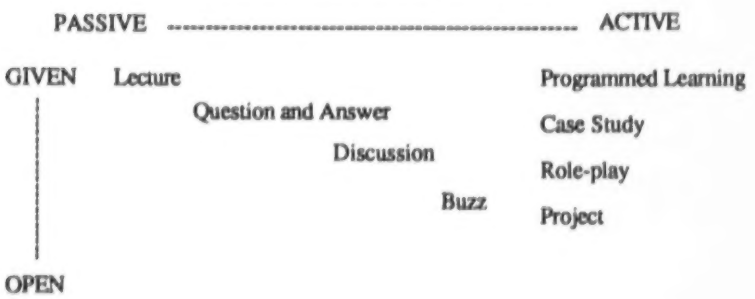
Descriptions

In addition to work which has tried to generate conceptual categories there is a substantial literature which can be described as offering descriptions of activities and methods. For example, a recent study of TVEI in Scottish secondary schools listed such non-traditional methods and innovations as 'student-centred learning, process learning, resource-based learning, active involvement, problem-solving, classrooms being more informal, pupils taking responsibility for their own learning, negotiation between teachers and pupils, differentiated learning, group work and individualised work, self-pacing, and student initiation' (Black, Malcolm and Zaklukiewicz, 1988). Listed like this, such a catalogue seems daunting, and brings with it questions of definition. Clearly, it is desirable to find some sort of framework for these approaches if discussion is not going to limit itself to the details of individual methods.

A small-scale study of teaching styles and strategies carried out by the School of FE at Jordanhill (1986) made use of just such a framework. With a sample of only 41 lecturers from 4 colleges their conclusions must be treated with some caution, but it is interesting to note the diversity of styles and strategies which the study encompassed. A two dimensional system of classification was used. The dimensions were the degree of **student activity** and the degree of **open-ness**. The degree of activity refers to the extent to which students are actively participating in the learning process or are just passive recipients of knowledge. The degree of open-ness refers to the extent to which learning is tightly structured, or whether it is open to student experience and to student choice.

Figure 3.2 shows the relationship between several teaching methods and these two dimensions. 'Lectures', for example, do not involve the student in any active way and consist mainly of imparting given information in a one-way line of communication. In contrast 'programmed learning' can demand the active participation of the student, although the material to be mastered is still 'given' by the programmed learning package. 'Project work' can be completely open in that the student can draw on his or her own experience and choose the project topic and approach. At the same time it also demands the active participation of the student. In common parlance, 'student-centred learning' has no precise definition, but tends to imply the use of teaching methods which would be situated towards the bottom right of this figure (ie towards the 'open' and 'active' ends of the two continua).

Figure 3.2
Classification of teaching activities



The predominant strategies used by the lecturers in the Jordanhill Study could be characterised as 'given activity', with 'open activity' used much less. Data supplied by the lecturers suggested that teaching styles were influenced by factors including preferred teaching style, tradition, willingness to change, and teaching philosophy. Even in the smallest unit of analysis, the individual teacher, a flexibility in teaching style was noted.

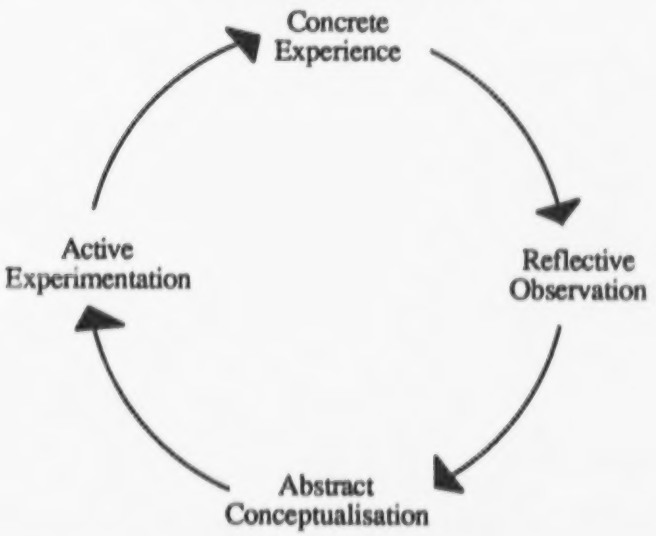
The data was gathered in the early days of the implementation of the Action Plan and another aim of the project was to consider whether lecturers' teaching styles and strategies had been influenced by this. In a comparison of the strategies used for modular and non-modular courses it was clear that modular courses were delivered with a greater degree of student participation. That is, there was a shift in

the Passive - Active axis. However, there was no corresponding shift in the Given - Open axis. Lecturers' comments suggested that in the majority of cases changes were a direct result of the directions given in the module descriptors. Whilst some lecturers were appreciative of alternative approaches of which they had previously been unaware or had not used, others were using new strategies because the 'Action Plan demands it'.

Overall, responses from interviews with lecturers indicated they had their own preferred teaching style and strategies but adapted these to accommodate the various conditions which impinged on their teaching. The 'chemistry of the class' was likely to be an influential factor in their choice of strategy, for example less motivated classes might require an 'all-singing, all-dancing Billy Connolly act'. It is interesting to note that this closely parallels the work carried out by Brown et al, previously referred to, on the influence of the conditions on the strategies adopted by teachers.

More recent work on teaching methods in the context of further education has been reported by Gibbs (1988) whose guide to 'learning by doing' outlines a system of teaching based on what he refers to as the **'experiential learning cycle'** (see Figure 3.3). This is the result of a series of action research projects led by the Educational Development Unit of Birmingham Polytechnic. The importance of this system is that it emphasises that no one teaching method is ideal in all circumstances or for all stages of learning, but rather that different methods are appropriate at different stages. In some ways 'learning by doing' is a misnomer as Gibbs stresses that 'doing' by itself is not enough to ensure learning. Neither is thinking by itself. Rather it is only when the thinking and the doing are linked together that learning will occur. The experiential learning cycle identifies four stages of activity, each of which must be followed in turn if learning is to take place.

Figure 3.3.
Experiential Learning Cycle



It is important to realise that this scheme includes more than just 'doing'. For example, in the 'abstract conceptualisation' stage it is quite possible that a very passive, didactic, teacher-centred approach

may be used to supply the student with the concepts which he or she needs but all stages must be followed if learning is to take place. Nor should we be misled by the word 'concrete' because a student can have a concrete experience of attempting a very abstract task (eg solving a quadratic equation).

While Gibbs outlines the teaching methods which can be used at each stage in the cycle, the importance of this model is that it emphasises that no one stage of the cycle is enough in itself, but that it must be combined with the other stages to ensure learning. Nor is it possible to make any simple judgements of the order that 'student centred' methods are always good, and passive, didactic methods always bad. Each may have a place in the cycle.

Critique

There are three main problems with those models of teaching which have been put forward.

1. the definition and complexity of the teaching process
2. many of the 'theories' on teaching are beliefs, not theories
3. the relationship of teaching to the learning process.

In addition, some of the theories described have evolved in specific educational contexts (the primary school or the FE college, for example) and may not be appropriate to other contexts.

Teaching is a complex process which may make use of many different approaches. It is therefore not surprising that research on teaching has produced many 'findings' rather than a generally accepted model of the process. The vocabulary used in some of the suggested models is varied and confusing, and many of the dichotomies used in them are only partially helpful in distinguishing and describing different aspects of teaching. They are ultimately inadequate because they fail to encapsulate the diversity involved. Broad typologies which claim to define notional 'teaching styles' ignore all the many contextual factors which may influence the activity of the classroom, causing the teacher's approach to vary almost moment by moment. Such typologies have often been generated outside the teaching context by researchers and may bear little resemblance to what the participants in the classroom see themselves as doing.

Another defect of the literature on teaching is the lack of a theoretical knowledge-base. As a result many suggested models have been based on beliefs rather than theories. The simple extrapolation of learning theory to teaching assumes a direct and simple connection between the activities of the teaching and the outcomes in the student. Especially in the case of 'pure' research on learning, much of which was developed through experiments on animals in a laboratory, this may fail to take account of the context of teaching. Neither does it make explicit the process whereby the teacher can produce optimum conditions for learning. Much of educational psychology documents general principles but leaves the teacher to infer particular approaches from them.

This leads to the problem of the relationship between teaching and learning. Whilst learning may be the desired product of teaching it is no simple matter to achieve it. There are many impinging factors which combine to make each classroom unique and make valid

generalisation difficult. Not the least of these is the student him or her self. It is the student who learns, and it may not be too much to maintain that the teacher has only limited power to ensure that learning does occur.

4 ASSESSMENT

Although systems of assessment can play a major role in determining the curriculum, assessment remains subservient to learning and teaching. Learning is a basic human activity which can be enhanced by effective teaching. One can assess what has been 'learned' or what has been 'taught', but it makes no sense to think in terms of teaching or learning what has been assessed (although teaching and learning what will be assessed is a different matter). Assessment therefore has a service function and most thinking about assessment relates to the way in which these services are provided rather than being theories about assessment as an end in itself.

While pedagogic needs have been important in developing thinking about assessment they have not necessarily been the sole impetus. Equally important have been those demands, related to access and selection, which have been placed on education by society. The introduction of written examinations to counter the nepotism which was rife in the Chinese Civil Service 3000 years ago had its parallels in 18th Century France and in the British Empire, beginning with the Indian Civil Service in 1855 (Ingenkamp 1977). Similarly, the development of examination boards in the United Kingdom, first as a means of selecting students for entry into the universities, and then as a more general means of accrediting attainments at the end of schooling, had its origins in a search for a way to allocate scarce resources in a more egalitarian way. Systems of examination and accreditation were therefore founded not so much on theories which identified their characteristics as on meeting perceived societal needs.

It would be wrong, however to imply that assessment as an activity is atheoretical. On the contrary, it is a popular belief amongst teachers that it suffers from a surfeit of theory. But in fact these 'theories' are more akin to the 'technologies' of teaching than to the 'grand theories' of learning such as rationalism, behaviourism and constructivism. To understand the evolution of assessment theory it is therefore appropriate to begin with the 'service functions' of assessment and to trace their development through the present century.

ASSESSMENT AS A SERVICE TO SCHOOLING

The Norm-Referenced Tradition

In 1905 Alfred Binet, a French psychologist who was interested in measuring 'intelligence', constructed a test which could be used to distinguish amongst 'average' children and those who were 'bright' or 'dull' and which could be used to measure 'mental age'. This approach was later modified by introducing an 'intelligence quotient' (IQ) which related 'mental age' to 'chronological age'.

This technology was translated and adopted by a group of Californian psychologists, notably Lewis Terman, who saw the opportunity to use intelligence tests as a means of sorting pupils into ability groupings or tracks. The potential of such tests to meet society's 'sorting' needs was also given a considerable boost by their use to sort 1.4 million American military personnel into 'appropriate'

roles when their country entered World War 1.

In 1917 Virgil Dickson, an associate of Terman, suggested that intelligence tests be used to identify 'mentally superior' and 'mentally deficient' pupils who would respectively be given 'accelerated work' and 'special class work'. 'Opportunity' classes were recommended for those who 'work very slowly' or who had 'fallen behind'. Wood (1985) reports that these proposals were well received and that 'school administrators and teachers found intelligence tests of immense practical value'. Wood identifies a number of reasons for the acceptability of intelligence tests in California at that time. Legislation had made education compulsory, the curriculum was moving from its classical tradition towards a focus which was seen as a more appropriate preparation for life, migration from the countryside into cities was placing new pressures on schools and 'intelligence testing and teaching reinforced some central values of the Progressive Era - efficiency, science and nativism ... group intelligence scores seemed to validate widespread assumptions about the inferiority of certain ethnic groups ... The invention of intelligence tests early in the 19th Century (sic) thus heralded a new role in society for schools as sorters' (Chapman, 1981, quoted by Wood, 1985).

In Britain similar pressures might account for the growth of intelligence testing which culminated in the **11+** or **'qualifying' examinations** which were used to allocate pupils to schools. Thom (1984) has identified two crucial principles of educational provision which paved the way for the introduction of the 11+ in 1944. These were that 'the age of 11 marked the first phase of children's lives and that after that age they should go to differentiated schools' and the principle, enshrined in the 'Haddow Report' of 1926 that at the age of 11, children could be classified by aptitude and allocated places in 'grammar schools', 'secondary modern' schools or in senior classes attached to primary schools. 11+ tests are still used in parts of England and in Northern Ireland although they were abandoned in Scotland in the 1970s on the introduction of 'comprehensive education'.

The influence of intelligence testing is clearly seen in these historical developments. However, there remain questions about exactly what was being tested. Binet's early tests claimed to be a measure of some underlying 'general ability' and, although later psychometricians, using more advanced statistical techniques, claimed to be able to identify other, more specific, 'factors' which pointed to the existence of different types of intellectual ability, the notion of 'general ability' continued to be important in the intelligence-testing tradition, particularly as it developed in Britain. It therefore remained at some distance from the subject-based curriculum of most schools and colleges.

It was a different matter with the associated 'technology' of testing. Intelligence tests were constructed on the assumption that different degrees of intelligence were distributed in the population along a **normal distribution curve** and that, therefore, fixed proportions of the population would be found in each part of the curve. If this is so, then it is an ideal way of 'spreading out' the range of intellectual ability in the population for purposes of selection. The 'normal curve' came to be applied to the results of all sorts of examinations, many of which had had comparatively little thought put into their preparation. A little reflection reveals one of the drawbacks to this:

teachers intend to impart knowledge to their students. If they have been successful in doing so then their students should be correspondingly successful in their examinations. However this would lead to a 'skewed' distribution curve which would have to be statistically manipulated in order to fit the assumptions of 'normality'. Acknowledgement of the success of some students would have to be sacrificed in favour of spreading the students along the normal curve. No matter how many students were capable of 'A' grade work, only a fixed proportion of them would get 'A' grades.

In practice test items and examination questions were often chosen, not because they would test what had been taught, but because they would discriminate amongst students. Items which most students could do (because they had been taught well) would not discriminate well and would be discarded. We therefore reach the situation where the test which best fits the assumptions of the normal curve is the one which is least related to the teaching which students have had.

The 'norm-referenced' tradition in intelligence testing can thus be seen to have had a pervasive influence on the structure of schooling. It reflects beliefs and assumptions about the unitary nature of intelligence which shaped educational opportunity for most of the 20th Century. Although public examination bodies in the United Kingdom have been less willing, certainly in recent years, to admit to its influence, the notion that a similar proportion of pupils will be awarded the various grades each year implies an acceptance that variation in achievement can be explained by fundamental attributes of pupils rather than variations in teaching or in the content of the examinations. Starting as a service to pedagogy, norm-referenced thinking can thus be seen to have influenced the ways in which young people are taught and the ways in which their transition from school to work will be controlled.

The Criterion-referenced tradition

Although the term 'criterion-referenced' was first used in 1963 it is likely that the idea of basing assessment decisions on performance compared to some 'absolute' standard rather than comparing performance with that of others has a much longer history. Its origins in the needs of the classroom is clear in what is probably the earliest documented description of such an approach. Nitko (1980) quotes a letter written in 1864 by the Reverend George Fisher, Principal of Greenwich Hospital School who describes a

> book called the scale book ... which contains the numbers assigned to each degree of proficiency in the various subjects of examination: for instance, if it be required to determine the numerical equivalent corresponding to any specimen of 'writing', a comparison is made with various standard specimens of 'writing', which are arranged in this book in order of merit: the highest being represented by the number 1, and the lowest by 5, and the intermediate values by affixing to these numbers the fractions 1/4, 1/2 or 3/4. So long as these standard specimens are preserved in the institution, so long will constant numerical values for proficiency in 'writing' be maintained. And since facsimilies can be multiplied without limit, the same principle might be generally adopted.

Quite how Fisher's staff dealt with a 17 point scale is not revealed. What is clear is that this approach to assessment made no assumption about the 'quota' of pupils who would be expected to perform at the various levels. Indeed, one can speculate that the aim of Fisher's staff would have been to have as many write at the highest level as possible - a stance which might reasonably be described as a basic aim of teaching.

While the nature of classroom assessment during this century is less well documented than the nature and use of 'intelligence tests', it was dissatisfaction with the theoretical implications of norm-referenced assessment in this context which led to the explicit recognition of the alternative criterion-referenced approach. Programmed learning is a teaching 'technology' which allows students to progress through successive 'frames' depending on their mastery of each particular aspect of the programme. If this system is to be effective sound decisions have to be made about whether a student is ready to move on. A group of American educators, most notably James Popham, was using this approach in their own teaching. Since they had a psychometric background they were interested in the quality of the assessment procedures which were used to make decisions to advance students through the programme. They found that tests constructed on a norm-referenced model were inadequate for their needs. The question being asked was whether a student had mastered a frame and was ready to progress to the next. Norm-referenced tests placed the students into rank order, but there was no sound way of knowing who within this rank was ready to progress.

The criterion-referenced model, like the norm-referenced model, thus had its roots in performing a service for the teaching/learning process. It was not unanimously welcomed by the testing community, not least because it is not easy to implement. Experience has shown that to be practicable it requires substantial clarity about what is to be assessed and what constitutes mastery. It is easier to construct a set of items more or less related to a particular area of learning and to craft them into a norm-referenced test which will place the students in rank order.

At the same time, the criterion-referenced approach has a number of features which make it attractive to educationists. In principle, a soundly constructed criterion-referenced instrument should:-

a) yield information on an individual's attainment irrespective of the attainment of others;
b) unambiguously relate to a well defined discrete domain of attainment;
c) allow individuals to be classified either as masters or non-masters or to be graded on attainment of the domain content.

Because of these attributes, Black and Dockrell (1984) showed that if the approach was used for diagnostic purposes in the classroom a number of attractive consequences could be identified. Amongst these (Black 1985) were that it can:-

a) provide clearly defined goals towards which students can work;
b) let students know unambiguously whether they have attained a given intended outcome;

c) allow teachers to develop more realistic expectations because they are more aware of the success students have with their learning;
d) increase student motivation and enhance professional satisfaction amongst teachers.

CRITIQUE

Despite their strong roots in the teaching and learning process both of these fundamental 'traditions' have limitations in meeting the needs of teachers.

Recent developments in assessment, certainly in Scotland, have tended to deny a number of the basic premises on which norm-referenced theorising has been based. The acceptance of innate general ability as an explanation for individual differences would now be held in question by all but the most single minded rationalists. The notion of ensuring that grades are distributed in 'normal' or even 'rectangular' distributions (SCRE 1977) would now be questioned by educationists on the grounds that it will not reflect the success of teaching and learning. Except in cases where selection is the main aim, decisions in education are more likely to be based on the extent to which performance satisfies predetermined criteria than on crude comparisons amongst potential students. In practice these distinctions are sometimes blurred but it is clear that the norm-referenced model no longer has the same strength in Scottish education as it had in previous decades.

It would be convenient to assume that because most decision-making is now based on explicit pre-determined criteria, it can properly be called criterion-referenced assessment. Certainly in Scotland, the design of the National Certificate is criterion-referenced (Black, Hall and Yates 1988). Similarly, the Training Agency/NCVQ 'Standards' model for vocational qualifications has most of the features that would satisfy the model. But it is possible to argue that some approaches, such as Standard Grade, have so compromised the fundamental notions of clarity as to be a pale reflection of true criterion-referencing. Even more doubt has to be placed on the extent to which the GCSE in England and Wales fits the bill.

These criticisms may or may not be justified, but they do identify problems with the criterion-referenced model which await resolution. Experience has shown that users of assessment information outside the learning environment have difficulty in interpreting the wealth of detail that true criterion-referenced assessment yields. This has been accommodated in the SCOTVEC and NCVQ systems by reporting at the 'module' and 'unit of competence' level. In Standard Grade there is a wealth of good pedagogic information at the 'EGRC/grade' level, but the need to aggregate this into attainment of a small number of 'assessable elements' for reporting purposes poses considerable problems.

A more general difficulty with criterion-referenced systems is that it can be very difficult to produce definitions of the domains to be assessed. The setting of performance standards encounters similar problems. Evidence from the United States and from our own work (Black, Hall, Martin and Yates 1989) suggests that while it may be difficult it is not impossible. Indeed the latter study suggests that assessments of acceptable quality can be obtained even in what are

generally considered to be 'difficult' subjects such as 'Communication' when staff have the facility to share their experience and where they collaborate in making assessments. Arguably, the process of arriving at such understandings has considerable professional advantages. But it is also time consuming.

BEYOND THE THEORIES

While it has been shown above that both the 'norm-referenced' and 'criterion-referenced' traditions are firmly rooted in the interests of educationists, it would be wrong to claim that the concerns they represent constitute the sum of thinking about assessment. On the contrary, most writing about assessment and indeed most practical application of it in schools and colleges is oriented around a series of 'what', 'how', 'who', 'why' and 'when' questions of which norm and criterion-referenced thinking relates largely to 'how' and to a lesser extent 'what'. It would be an inadequate review of current thinking in assessment if each of these questions were not addressed, however briefly.

What is to be assessed?

When norm-referenced intelligence testing held sway there was often thought to be little ambiguity about what was being assessed. Individuals were seen as varying in their 'general ability' and intelligence tests measured this. The fact that this could apparently be subdivided into general attainment in various school subjects did not seem to be thought inconsistent and indeed, universities in the United Kingdom still use a 'points' system to aggregate examination grades in different subjects into a single index, a process which might be seen to be based more on expedience than principle.

There is no space here to describe the substantial debate surrounding the nature of competence, performance, general attainment and specific attainment. It is true that there is now a greater range of attainments assessed. It is now unusual for overt measures of 'general ability' or indeed 'general attainment' to be used as a unit of assessment in educational practice. Furthermore, the last decade has seen a substantial increase in the assessment of both personal characteristics (such as 'initiative' or 'working in groups'), and attitudes alongside the knowledge and understanding of aspects of the curriculum which had previously been dominant. However, the extent to which these assessments are interpreted by users in terms of specific competences or general ability must be held in question. It would be surprising if this were not the case given the diversity of assumptions about the nature of learning which exist.

How is it to be assessed?

In addition to answering questions about 'how' assessment takes place in terms of 'norm' or 'criterion' referenced models, one can describe the process in terms of the basic instruments which are used. It is probably the case that most of the assessment which takes place is carried out by teachers using ordinary classwork or workshop activities as the 'instrument'. There is little or no historical evidence about the nature of these procedures but it seems likely that while changes in teaching method may have led to a change of emphasis, teachers use the same basic craft skills today as they always have.

This would not, however, be true of formal assessments. While the stereotypical 'written examination' or 'multiple choice test' is still widely used, assessments are now carried out using a wide range of methods. Practical testing, student self-assessment, oral testing, aural testing, project work, folio accumulation, profiling, records of achievement and many other procedures have become commonplace in schools and colleges. These in turn have spawned many systematic studies about their technical attributes and the nature of the decisions that they yield. It is to this that much 'assessment theory' relates. Teachers tend to regard much of this work as obscurantist and irrelevant. Much of it is obscure because it exists at the interface between psychometricans, statisticians, mathematicians and educationists each of whom may have different interests in the questions that can be asked. However, because educationists use assessments to make decisions which may have substantial implications for the life-chances of students, questions about the quality of assessment cannot be dismissed as irrelevant. The increasing focus on the criterion-referenced approach, which by its nature is more open to public scrutiny, is likely to exacerbate the situation (witness court cases in the United States disputing assessments of minimum competence). Quite how much knowledge of these theories is required by teachers for ordinary classroom assessment remains open to question.

Who will do the assessing?

Questions about teachers' knowledge of assessment theory are important because recent years have seen greater responsibility for assessment being given to teachers. The National Certificate has clearly moved dramatically in this direction. Evidence from our earlier work (Black et al 1988) suggested that this was not a move resented by teachers. However, it is an additional responsibility and some teachers recognise that it has implications not only for assessment but also for the ways in which they relate to their students in the classroom.

Why should we assess?

While much of the attention given to assessment is focussed on accreditation, this may not always be the case and indeed the roots of the two major assessment traditions lie in essentially pedagogic or educational management issues. It would be fair to say however that although most of the 'assessments' carried out in schools and colleges are for purposes other than accreditation, most of the literature on assessment and most of its focus in recent years has been related to 'certification'. Perhaps because of this, both the Dunning Committee's report on assessment in S3 and S4 (SED 1977) and the Action Plan (SED 1983) tried to redress the balance by stressing the potential of **diagnostic** or **formative** assessment as an aid to the teaching/learning process.

The origins of diagnostic assessment can be found both in psychological testing where it has been associated with the analysis of 'fundamental' learning difficulties and in ordinary classroom work. Simple diagnostic tests could be found in mathematics textbooks in the 1940's. The semantic confusion between this term and the later 'formative' assessment is seen by some (Simpson 1988) to be important and by others (Black, Devine and Turner 1988) to be irrelevant. What is undoubtedly the case, however, is that there is

now greater awareness of the broader purpose of assessment in Scottish education.

When should we assess?

Finally, it is worth noting that the literature contains a substantial amount of thinking about <u>when</u> assessments should take place. The stereotype of formal assessment has been the major written examination set at the end of a course of study. This was challenged in the 1960's by a growing interest in 'continuous assessment' which was claimed to offer a fairer representation of competence than the 'one-off' test. Whether the reality of continuous assessment has been to make accreditation more 'fair' or whether it has only spread the anxiety associated with accreditation over a longer time is open to debate. What is evident however is that the traditional British notion of accreditation being based on a single end of course examination is no longer prevalent. The National Certificate relies almost exclusively on continuous assessment and most Standard Grade subjects include a teacher-assessed 'internal element'.

However, these changes are not without problems. Our earlier studies in the National Certificate (Black et al 1988 and 1989) indicated that some teachers were uncertain as to whether mastery simply implied that a student 'had met' a particular requirement of the module or whether it should indicate a more enduring 'can do' statement. This is not a new phenomenon - how many holders of 'Higher French' can recognise the 'past historic'? It does however show that pragmatic thinking about assessment is insufficient if not grounded on more fundamental theoretical principles.

5 THEORY AND THE NATIONAL CERTIFICATE

The purpose of this section is to consider the ways in which teaching, learning and assessment are described in the 'Action Plan' and 'National Certificate' literature and to relate this to some of the broader thinking in these areas described above.

While the 'Action Plan' and 'National Certificate' (applied) literature includes accounts of what are considered to be appropriate approaches to learning, teaching and assessment, there is not always a clear relationship between this and the 'theoretical' literature described above. This is particularly true in relation to learning. One reason for this is that the National Certificate literature relates to a very particular context in which learning and teaching takes place. It must reflect the needs of the students for whom it was designed as well as its roots in vocational education and training; a role which, perhaps more than in other educational contexts, must balance the aspirations of students, the views of teachers and the needs of employers. With that background it would be surprising if the associated literature were not to reflect context as much if not more than theory.

Learning

There is considerable discussion in the applied literature about 'learning'. The three themes which predominate in this can be characterised as concerns with the **content** of learning, the **purpose** of learning and **approaches** to learning. Of these, only the last is directly interpretable in terms of learning theories. However, an account of the other areas is essential if the nature of thinking about learning in these documents is to be understood.

Although it can be argued that discussions of the **content** of learning are misplaced in a consideration of learning *per se*, differences in what is to be learned can determine the strategies appropriate to bringing about learning. This is important in any analysis of teaching and learning in the National Certificate. The documents suggest that the Action Plan set out to challenge what were seen to be some traditional views of further education, and in particular an assumption that the curriculum be restricted to the acquisition of specific vocational knowledge and skills. If it is the case that what is to be learned differs significantly from the previous curriculum, then it would seem likely that the way in which learning takes place will have to alter. What kind of statements are made about what is to be learned?

The 'Guidelines on Learning and Teaching Approaches' (SED 1985) identify five broad clusters of aims for educational programmes for post 16 education. These comprise,

(i) developing knowledge of one's self, one's community and one's environment.

(ii) developing skills, ranging from basic numeracy and literacy to higher order academic and process skills.

(iii) developing practical and physical skills, including those appropriate for handling equipment and for the expressive arts.

(iv) developing inter-personal, social and life skills.

(v) developing positive attitudes towards life in general and towards the learning process in particular.

Clearly these suggest a curriculum which is broader than a list of specific knowledge and skills. Furthermore, given the way in which the National Certificate describes units of learning in terms of 'learning outcomes' which are often highly specific, it raises questions about how 'effective' learning is to be promoted and might be recognised. In essence this suggests a need to consider whether the whole is greater than the sum of the parts. And this question is given added force when one considers statements in the literature about the **purpose** of learning for the 16+ age group.

The purpose of learning as described in this literature can be summarised in terms of a number of key words including 'relevance', 'responsibility' and 'transferability'. Education is seen as a preparation of individuals for roles in a rapidly changing society where they will have the ability and motivation to adapt to new challenges. These aims are clearly associated with relevance and with developing competences which are transferable to novel situations. At the same time it is asserted that students must develop awareness of responsibility within the community.

Throughout the literature there is a clear assertion that certain **approaches** to learning will result in the achievement of aims such as these. For example, participative learning approaches are suggested as the means to encourage 'the development of independence'; 'confidence can grow when students are given opportunities to do things by, and for, themselves'; 'motivation will depend on the extent to which learning experiences can be negotiated'. These participative modes are intended to 'actively involve' the student in the whole of the learning process, from negotiation of programme choice and choice of learning approaches, to the use of assessment to review their progress.

As well as promoting student participation in the learning process, emphasis is given to the development of **'good study habits'** such that 'students should develop the ability to organise their own learning'. In order to develop these skills it is suggested that teachers should 'help students to analyse their learning experiences and evaluate their own performance'. The mention of student participation and the development of study skills hints at a recognition of the role of metacognition in the learning process. But even if this is not explicit there is a clear commitment to the notion that 'the process of learning is more important than the content, and that it is through the experience of the process that young people acquire the capacity to learn for themselves'.

It is in these accounts of what are seen as appropriate approaches to learning that evidence about possible relationships between theoretical perspectives and the National Certificate literature are to be found. Perhaps what is most clear however is that there is little evidence of a direct relationship between theory and recommendation. This might be because the theory is seen as irrelevant, or because its substance was not known to the authors. Alternatively, the authors may have considered it either to be so well known to potential readers that there was no need to make the links explicit or that it was inappropriate to make links explicit in what

were seen as practical documents. Whatever the reason, the outcome is that one has to search for possible relationships rather than list any direct commentary on them.

Little if anything in the literature suggests a rationalist view of learning. Indeed, rather than an assumption that learning potential is innate and some students are naturally better than others, there is the view that any student can ultimately achieve success in any module. Whether this is a perspective which is sustained in application may be another question. Our earlier studies, for example, suggested that in some instances very general assumptions are made about the inherent limitations of some groups of students (such as those involved in YTS) and the likely strength of others.

There is a sense in which the disaggregation of learning content into modules and learning outcomes which are intended to promote success and increase motivation, accords with behaviourist thinking about learning. However, the way in which the learning environment is managed is more likely to be the determinant of the way learning takes place than is the modular structure itself. Furthermore, the emphasis placed on taking account of students' prior knowledge and on providing learning experiences which actively engage the student could reasonably be interpreted as being based on constructivist thinking. But if learning theorists themselves have yet to arrive at a single explanation of the learning process should one be surprised that the Action Plan was not built on any single model? Indeed it might reasonably be argued that by advocating a broader range of approaches to learning than appears to have been the case in the past there may be greater scope for ensuring that a greater range of learning styles can be accommodated. This would certainly imply that theories about differences identified as important in student-oriented studies would be better reflected in practice. The proof of course will only be available through a study of what actually happens in classrooms.

Teaching

There are few explicit references to teaching in the original Action Plan (SED 1983) but what is said is important. 'Didactic' approaches are deprecated and instead a range of approaches is advocated.

> 'It is important that the content of the modules is not interpreted as only the acquisition of knowledge, since this view commonly leads to a didactic approach to teaching and learning ..... A wide variety of approaches to teaching will therefore be required in order to cover the range of objectives listed in each module' (para 4.10)

Subsequent documents clarify the styles of teaching considered appropriate. Methods which include working alone, in pairs and in groups are advocated. Group discussion, debate, practical work, case studies, projects, assignments, simulations and work experience are also suggested. Overall, several general principles can be identified, including;

- the encouragement of student initiative and taking responsibility for their own learning
- the teacher's role as mentor and manager of learning
- promotion of heuristic approaches with an emphasis on practical activities, discovery learning and problem solving

- tailoring the module descriptor to students' needs and to local circumstances

We have already indicated that while the literature on learning can reasonably be described in terms of 'theories', most accounts of teaching are better described as classification systems. Perhaps because these comprise categories of practice it is easier to to relate the applied literature to the theoretical literature on teaching than it was in the case of learning. Indeed our account of suggested methods listed above has already drawn on notions such as the degree of student activity and the openness of the learning process to offer a description.

The cautious stance taken on didactic teaching approaches associated with the acquisition of knowledge, and the espousal of more 'active' and 'open' student-centred approaches would suggest that amongst Scheffler's 'philosophical models', the least appropriate would be the 'impression model'. This of course is not surprising if, as we suggested above, overtly behaviourist approaches to learning are not apparently advocated.

There can be less certainty as to whether teachers' interpretations of these suggestions would support 'insight' or 'rule' approaches. This has parallels in our uncertainty as to whether teachers will explicitly or implicitly adopt a rationalist stance to learning. Active, open, student-centred methods of teaching might well be used, for example, to describe classroom activites in Montessori schools where the aim is to bring about 'spontaneous manifestations of true potential'. The same methods might equally be used in a constructivist context where each student was working at a point appropriate to his or her existing schemata. Which of these interpretations of student-centred strategies is adopted by college staff is an empirical question which awaits investigation.

It will also be clear that the applied literature would probably suggest that 'progressive' teaching methods were being advocated rather than 'traditional' methods. However, one must be cautious in reading too much into such categories. Not only are they both value-laden and difficult to apply, but the reality is that a mixture of teaching strategies is advocated in the applied literature. Sharp distinctions such as these can be effective in stimulating debate but can pose problems when they become labels.

Finally the teacher-derived model, which is probably closer to a 'theory' about teaching than the classification systems already described is also useful in analysing the applied literature. Thus, several of the overall principles outlined above, such as the teacher adopting the role of mentor or manager, have a parallel in the 'normal desirable states' of Brown and McIntyre (1988). A second parallel can be made between the 'conditions' identified by Brown and 'factors' which influence the selection of teaching strategies outlined in the Action Plan Staff Development (APSD) modules:

> factors influencing the selection of appropriate learning and teaching approaches eg class size; time available; nature of learning outcomes; teacher's preferred style; availability of equipment, resources and support services; students' previous experience, abilities, needs, interests and preferred learning style.

It would therefore appear that there is a greater commonality between the Action Plan and National Certificate literature and the 'theoretical' literature on teaching than was the case with learning. Whether this tells us more about the way in which the Action Plan was written or about the nature of writing about teaching is perhaps worthy of debate.

Assessment

It is in a comparison between the technical literature on assessment and the National Certificate literature that there is the greatest similarity. In this case the National Certificate literature is clearly built on the criterion-referenced model, and indeed is arguably one of the most interesting examples of theory being transformed into practice available. Furthermore, the intended purposes and principles of assessment are made clear and there is detailed consideration of the mechanics and technicalities of constructing and administering assessment instruments.

It is clear that assessment is intended to have a supportive role in the learning process. This is to be achieved by integration of the assessment procedures with teaching and learning. This is in contrast to the previous system of summative assessment which is seen as having a dominant but negative effect on the curriculum.

The move from an essentially norm-referenced system to one which is criterion-referenced has resulted in an assessment system which is very different from the pre-National Certificate system. One of the major features of this change is that what is to be assessed has been both extended and sharpened. The notion of testing a 'general ability' has been put aside in favour of assessing clear, specific and much smaller 'domains'. As well as this sharpening of the focus of what is assessed there has been a shift in emphasis from the more basic cognitive aspects of knowledge and recall to those of understanding and application, including problem-solving. But although the extent of what is assessed has increased, there are areas which are not explicitly addressed in the applied literature such as 'increase in self-reliance', despite the fact that these are given as general aims of the Action Plan. The implication would seem to be that the wider range of modes used to assess and teach, eg working in groups and student-centred learning, will encourage these less tangible aspects of students' progress; what is missing is a commitment to assessing them.

The recommended assessment procedures incorporate a wide range of the principle features of constructing and administering assessments, including the construction of instruments and the interpretation of outcomes. But while the importance of valid and reliable instruments is stressed, the guidelines encourage as much assessment as possible, both formative and summative, to be carried out in natural classroom contexts, thereby minimising the need for specially created 'tests'. The change in nature and range of assessment instruments used in the National Certificate reflects the move towards acknowledging the importance of the 'everyday', ongoing assessment which has always occurred but which has not previously received public recognition. It is these informal and formative assessments which underpin teaching and learning and enable individual students to make progress. Although the corresponding technology represents a major change in the basis of assessment the applied literature does not give much attention to

potential problems but appears to assume that the technical guidance given will guarantee assessment instruments and decisions of adequate quality.

In considering the purposes of assessments, the applied literature highlights the change of emphasis from meeting the extrinsic requirements of society (such as global 'sorting' for purposes of selection) to the more intrinsic diagnostic needs of individual students. This greater emphasis on diagnostic or formative assessment is seen as part of the process of providing clearly defined goals for both lecturer and student:

> There are several important purposes of assessment which must be recognised. Assessment offers feedback on progress, diagnosis of individual strengths and weaknesses, assistance in making informed and realistic curricular and vocational choice, evaluation of teaching, as well as assistance in selection of employment and/or further stages of education ... In recent years assessment has tended to become more integrated with the processes of learning and is seen as having a diagnostic rather than a discriminatory value.
>
> (SED 1983 para 4.23)

and

> While norm-referenced assessment is the form which has been most commonly used in the past at all levels of education it has become clear that, for most purposes, some form of criterion-referenced assessment is much more informative and therefore more useful.
>
> (para 1)

With a greater emphasis on the formative function of assessment the literature encourages the ongoing nature of assessment, permitting it to be carried out when it is appropriate for teachers and their students rather than as single terminal examinations.

6 PRACTICE AND THEORY

One of the main purposes of this overview of the literature was to develop a shared understanding of thinking on learning, teaching and assessment in order to inform our subsequent research into the National Certificate.

However, it should be clear by now that many of the ideas and concepts which we have outlined exist, in pure form, only in the rarified atmosphere of theoretical writing. Indeed, even the applied literature which relates directly to the National Certificate is more an expression of hopes and intentions than of achieved aims. In the real world there are so many other constraints and competing priorities which impinge on any educational development that the outcome of its implementation can sometimes seem to be only very distantly related to those original intentions.

It is the purpose of the 'Teaching, Learning and Assessment in the National Certificate' project to investigate that real world and to find out what those who are involved with the National Certificate think about it. To that end the research team will conduct a series of interviews with staff, students and employers and, from the information gathered, construct and administer a large scale questionnaire survey of each of these groups. Naturally, many of the questions which we ask will reflect the theoretical issues which we have touched upon in this paper.

The results of these interviews and questionnaire surveys will enable us to map out the thinking about teaching, learning and assessment within each of these groups of teaching staff, students and employers. The descriptions which we thus obtain are not, however, the sole aim of the project. We would hope that the concepts and ideas contained in this document would enable us to go further and attempt to understand and explain any differences between, or within, groups which this research may uncover. The bulk of the research will be carried out in academic session 1989/90 and we hope that a final report will be publicly available some time in the early part of 1991.

The ideas which we have outlined here will provide us with tools for the analysis of the research data which we will gather. It is because we believe that these ideas may also help others to place their own thoughts about the National Certificate (and perhaps about other educational innovations) in a wider context, and so come to understand them better, that we are making this document publicly available.

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